

Genetic diversity and population structure of the agroforestry fodder tree species Afzelia africana Sm. in Benin



Thierry D. Houehanou^{1,2,3,4,*}, Kathleen Prinz², Frank Hellwig², Gérard Gouwakinnou^{1,3,4}, Achille E. Assogbadjo^{1,4}, Jens Gebauer⁵, Romain L. Glee Kakaï⁴, Brice Sinsin¹

Background

- Afzelia africana, a valuable fodder tree species for livestock in its occurrence range in Africa;
- It is preserved as agroforestry tree species in Sudanian zone of Africa
- Up to now, molecular ecology data is lacking to motive the conservation of this tree species
- Indeed, molecular ecology researches become an important way to guide conservation of forest genetic resources

Research questions

- □ How the genetic diversity of A. *africana* is patterned along the climatic aradient?
- How far extent the genetic population structure is differentiated among the different climatic zones?
- What are the potential implications for the species conservation in Benin?

Nethods



- Benin republic is a West Africa country located between latitudes δ°10'N and 12°25'N and longitudes 0°45'E and 3°55'E (Fig. 1).
- □ Leaflets of 170 individuals of A. *africana* were sampled in three climatic zones (Sudanian, Sudano Guniean, and Guineo-Congolean areas) in Benin

Fig. 1: Location of sampled populations in Benin republic

- Leaflets were dried in silica gel and stored at room temperature
- DNA of leaflet samples were isolated with the CTAB modified protocol (Doyle & Doyle 1987; Saghai-Maroof et al. 1984)
- A total of 12 SSR repeats loci (Donkpegan et al. 2015; Houehanou et al. 2019) were used to genotype the 170 individuals
- The DNA fragment bands were scored
- □ Genetic diversity parameters were calculated: Alleles richness (Na),
 Observed (H_o) and Expected (H_e) heterozygosities; Inbreeding coefficient within individuals (Fis); differentiation index (Fst)
- PCoA based on genetic distance between individuals and Mantel test were performed
- Admixture model structure was performed in Structure 2.3.4 software (Pritchard et al. 2000)

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- ¹Laboratory of Applied Ecology, University of Abomey Calavi, Benin.
- ²Institute for Ecology and Evolution, Department for Systematic Botany with Hausknecht Herbarium and Botanical Garden, Friedrich-Schller-University Jena, Philosophenweg 16, 07743 Jena, Germany
- ³Laboratory of Ecology, Botany and Plant Biology; Faculty of Agronomy, University of Parakou, BP 123 Parakou, Republic of Benin
- Laboratoire de Biomathématiques et d'Estimations Forestières, Faculté des Sciences Agronomiques, Université d'Abomey Calavi, 04 BP 1525, Cotonou, République du Benin
- Sustainable Agricultural Production Systems with Special Focus on Horticulture, Faculty of Life Sciences, Rhine- Waad University of Applied Sciences, Marie-Curie-Straße 1, 47533 Kleve, Germany

Kesuits						
Table 1: Genetic diversity parameters among climatic zones						
	Alleles richness (Na)	Observed heterozygosity (H _o)	Expected heterozygosity (H _e)	Inbreeding coefficient within individuals (Fis)		
Sudanian	9.58	0.848	0.765	-0.124		
Sudano - Guinean	10.08	0.877	0.753	-0.179		
Guineo - Congolean	8.16	0.818	0.752	-0.100		

distance (P = 0.01).



Sudanian Sudano - Guineo -Guinean Congolean 0.001 0.001 Sudanian Sudano -

Table 2: Pairwise Fst values among subpopulations. The Fst values are below the diagonal and the Probability are above

0.019		0.001	Guinean			
0.024	0.021	-	Guineo - Congolean			
The Mantel test on the relationship between genetic and						

geographical distances revealed a significant isolation by

Figure 2: Principal coordinate analysis based on 170 individuals of A. africana sampled from Southern, Central and Northern populations in Benin and revealed by 12 SSR



Figure 3: Genetic admixture structure in 170 individuals from the three climatic zones in Benin. The structure was based on K = 4 as the best K revealed by STRUCTURE (Pritchard et al. 2000) and STRUCTURE HARVESTER software vA.1 (Earl and von Holdt



Figure 4: Fruit and adult individual of A. africana from Benin.

2012).

Conservation implications

- □ in situ conservation of gene pool in each climatic zone
- in situ conservation of gene pool of Sudano Guninean zone in Guineo Congolean zone
- in situ conservation of gene pool of Sudanian and Sudano Guinean zones in Guineo – Congolean zone
- Ex situ conservation of gene pool seeds of each climatic zone



Corresponding: thierryhouehanou@gmail.com